Attachment B

RESCO Collateral Categories

General Introduction:

This solicitation seeks proposals from communities wishing to develop, pilot or implement plans to transition to primary dependence on local or nearby renewable energy supply in the coming decade. If successful, such communities will achieve a level of energy security that distinguishes them from others that continue to rely exclusively on importing energy from sources far from the community; hence the title of the solicitation, Renewable-based Energy Secure Communities (RESCOs). Attachment A addresses RESCO Technical Integration projects.

This solicitation also seeks to support RD&D efforts on certain collateral categories that may be important to some or all RESCO communities at some stage of their development. Proposing communities may elect to team with organizations having specialized technical expertise in these collateral categories. In this case, separate proposals are required for a community's technical integration project and for the community's collateral project(s). This attachment addresses RESCO collateral projects.

For technical integration proposals and for each individual collateral project category, it is the Energy Commission's intention to fund the highest scoring proposals, to the extent of available funds.

Specification of Potential Projects:

The Energy Commission has allocated funding for RD&D addressing the following specific topics, because they relate directly to the RESCO vision:

Attachment B1. Integration and implementation of smart grid concepts in the RESCO context

The maximum level of funding for this category is $1,000,000 (PIER Natural Gas Funds).

Attachment B2. Dairy bio-gas or bio-power technology characterization, assessment and validation

The maximum level of funding for this category is $1,000,000 (PIER Natural Gas Funds).

Attachment B3. Demonstration of low emission technologies for conversion of biomass-derived fuels such as biogas

The maximum level of funding for this category is $300,000 (PIER Electricity Funds)

Attachment B1

Renewable Energy Integration and Piloting or Implementation of Smart Grid Concepts in a RESCO Context

Introduction:

The main objective of this collateral category project is to develop, pilot or implement integration solutions applying smart grid infrastructure to the integration of RE sources in a California community.

For twenty years or more the electric utility industry has envisioned more automated operation of electricity delivery systems. The initial stages of implementing the vision take the form of automated customer metering, advanced metering infrastructure, load control and demand response.

Advanced Metering Infrastructure (AMI) refers to systems that measure, collect and analyse energy usage, from advanced devices such as electricity meters, gas meters, and/or water meters through various communication media on request or on a pre-defined schedule. This infrastructure includes hardware, software, communications, customer associated systems and meter data management (MDM) software.

The network between the measurement devices and business systems allows collection and distribution of information to customers, suppliers, utility companies and service providers. This enables these businesses to either participate in, or provide, demand response solutions, products and services. By providing information to customers, the system assists a change in energy usage from their normal consumption patterns, either in response to changes in price or as incentives designed to encourage lower energy usage use at times of peak-demand periods or higher wholesale prices or during periods of low operational systems reliability.

AMI "raises the bar" with regard to traditional automatic meter reading (AMR) in that it enables two-way communications with the meter. Traditional systems which were only capable of meter readings don't qualify as AMI. [1]

Communities deploying RE sources and related energy storage in their building stock will have a special interest in these aspects of smart grid implementation, because RE sources add flexibility in controlling overall load and responding to demand.

For reference, the new National Energy Independence and Security Act signed in December 2007 includes a separate title that addresses specifically what the Smart Grid of the future is expected to include. According to Section 1301 of Title XIII, the Smart Grid contains:

- Digital information and controls
- Dynamic optimization with cyber-security
- Distributed Resources and DG, including renewable energy
- Demand Response and Energy Efficiency
- Smart technologies for metering, grid communications and distribution automation
- Smart appliances and consumer devices

[1] Italicized text is excerpted from http://en.wikipedia.org/wiki/Advanced_Metering_Infrastructure Nov 24, 2008

- Advanced storage and peak-shaving technologies, including PHEVs and thermal-storage A/C
- Information and control options to consumers
- Standards for communication and interoperability
- Identification and lowering of barriers

Scope of Work:

This Collateral Project includes piloting or implementing integration solutions applying smart grid infrastructure to the integration of RE sources in a California community.

The following partial list of questions is offered as an indication of the issues that must be resolved inherent in this category of integrated RE solutions:

- What is the role of smart grid technologies in facilitating a robust mix of community based RE sources integrated with energy efficiency, energy storage, CCHP and co-production of transportation fuels?
- What are the necessary steps toward a community level smart grid that has the capability of intelligent auto-balancing, self monitoring, minimizing environmental footprint, preventing outages, providing real time communication, accepting any mix of renewable sources and natural gas based electricity generation?
- Can a community based energy infrastructure optimize consumer energy usage based on environmental and price preferences and do so with minimal human intervention?
- What are the initial steps toward operating RE generation technologies and other technologies in a coordinated way using dynamic control systems?
- Will high performance mini-grids, smart grids, and distributed utilities be capable of providing lower cost power with high availability, reliability, power quality and minimal environmental impacts?
- What will be the role of smart grid technology in:

    - Enabling active participation by community-based consumers?
    - Accommodating optimum mix of renewable generation and storage options?
    - Enabling new products, services and markets from communities?
    - Providing power quality for communities and improve economy?
    - Anticipating and responding to system disturbances?
    - Operating resiliently against attack and natural disaster?
    - Enabling building automation in communities (e.g., intelligent building controls and home area networks, and establishing)?
    - Facilitating intelligent interfaces between buildings in the communities and the larger energy grid?
    - Developing and implementing advanced network and metering technologies like automated metering and more sophisticated power electronics?
    - Utilizing the capabilities of electric system communications capacity?
    - Enabling demand response?

- What information and evaluation tools are needed to provide electricity and natural gas customers the ability to make informed decisions regarding RE technologies, e.g. is there a need for:

- A database of information on RE resources available in the customer area, plus general background information on end use and building integrated RE supply options?
- An easy to use and understand evaluation tool that provides approximate sizing and cost of renewable technologies that could be considered by the customer, along with an estimated impact on overall electricity use and bills, and comparison to other options?

Attachment B2

Dairy Biogas and Biopower Technology Characterization, Assessment and Validation

Introduction:

The purpose of this RESCO Collateral effort is to quantify, through a combination of field and laboratory studies, the technical, economic and environmental performance of California dairy power systems including manure and effluent handling, anaerobic digestion, biogas-to-electricity generation, and transportation fuels processes. This purpose can be achieved by monitoring, sampling, and analyzing material flows, documenting energy consumption and generation, and completing detailed element, mass, and energy balances on specific operating systems at sites containing operational dairy biogas power systems. At least five sites currently containing operational dairy power systems in California will be included in the study.

Scope of Work

The successful applicant must perform all of the following:

- Evaluating the physical, chemical, and biological conversions and transformations involved in dairy biogas power systems in order to determine the fate of solid, liquid, and gas phases of carbon (C), nitrogen (N), phosphorus (P), potassium (K), sodium (Na), Sulfur (S), and their chemical compounds that have effects on energy, air, water, and land.

- Collecting required data from at least five sites currently containing operational dairy power systems in California that will be evaluated.

- Collecting additional data on factors that may apply to meeting requirements related to air and water permits, land management, and public health. Such data may include odors, dust, other fugitive emissions, pests, and pathogens.

- Obtaining pertinent economic data in order to determine the cost effectiveness of the dairy projects or sites selected for power generation and transportation applications. Pipeline injection to natural gas grid should be evaluated.

- Monitoring each site for a period of 12 consecutive months while recording all relevant mass, volume, and energy flows for integrated dairy power system including manure and effluent handling, anaerobic digestion, and biogas-to-electricity generation processes.

- Installing continuous automatic data acquisition systems to record system temperatures, pressures and local meteorological data necessary to complete a full energy balance. Data must be recorded using a sampling interval of one hour or shorter.

- Completing the work within 24 months from the date of Grant Agreement execution.

Attachment B3

Demonstration of Low Emission Energy Conversion System Using Biomass-Derived Fuels

Introduction:
The main purpose of this RESCO collateral effort is to demonstrate a low cost and low emission energy conversion technology using biogas such as landfill gas or biogas from anaerobic digestion of livestock manure and other organic wastes.

Only fuel cell, homogenous charge compression ignition (HCCI) engine and microturbines technologies have shown promise for achieving the 2007 California Air Resources Board (CARB) performance standards using biomass-derived fuels such as biogas and landfill gas. There is a need, however, to develop a low cost and low emission energy conversion system that matches the scale of RESCO applications such as landfill gas or biogas conversion to electricity.

Scope of Work:

The overall goals of this technology development fueled by biogas (e.g., landfill gas) are to:

- Demonstrate the market ready potential of low-emission conversion technology as a low cost and high efficiency source of electric power generation from biogas.
- Generate Electric Power at least 200 to 300 kW target.

The technical performance objectives of this work should be:

- Achieve greater than 35% Brake Thermal Efficiency
- Achieve air emissions at:
    - o < 0.07 lb/MW_ehr NOx
    - o < 0.08 lb/MW_ehr CO
- Enhance reliability, availability, maintainability, and durability relative to current state of the art.
- Demonstrate multi-fuel use capabilities.
- Establish baseline emissions and efficiency for the conversion method to be used.

The economic performance objectives of this work should be:

- Reduce the currently projected cost of electricity generation to < $750/kW.
- Exceed current and future California atmospheric emissions requirements.
- Achieve high fuel-to-electricity conversion efficiency.
- Lower or maintain currently estimated capital cost, installation cost, operation and maintenance cost, and/or life cycle costs for commercial systems.